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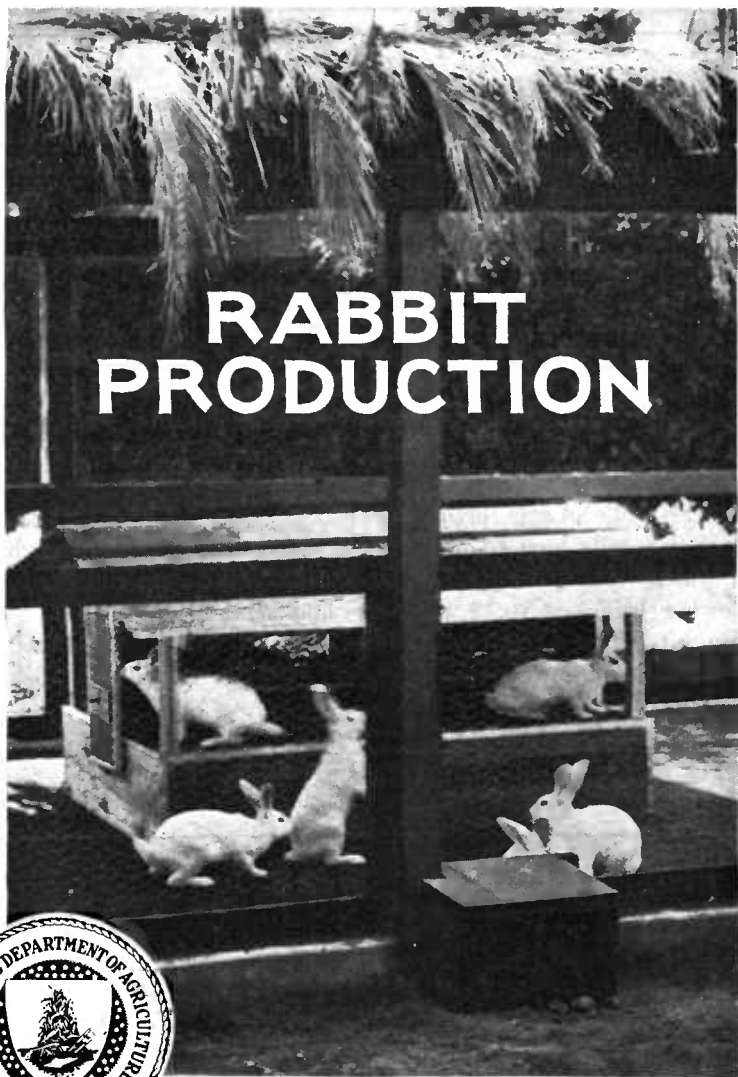
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U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1730

RABBIT PRODUCTION



RABBIT RAISING has become an important minor farm industry in some parts of the United States, and it fits in well as a side line to general farming. No animal is better adapted for use in 4-H club work than the rabbit, and on a small scale rabbit raising affords the suburban family an excellent opportunity to reduce its meat bill and at the same time provide an agreeable occupation for boys and girls.

Rabbits are raised for both food and fur. The market for rabbit meat is established in some sections, but in others the prospective rabbit raiser will need to develop this outlet for his product before making heavy investments. Rabbit fur, on the other hand, is already used extensively—in fact, more than any other kind.

This bulletin sets forth the essential principles of rabbit raising and tells how to apply them in practice. It supersedes Farmers' Bulletin No. 1519, Rabbit Skins for Fur; and the following leaflets: No. 4, Raising Domestic Rabbits; No. 15, Rabbit-House Construction; and No. 22, Chinchilla Rabbits for Food and Fur.

RABBIT PRODUCTION

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INTRODUCTION

RABBIT raising no longer has to do merely with pet stock, and in some parts of the country it has developed into a business of large proportions. A number of commercial rabbitries have been established, both on large and small farms and in the suburbs of cities (fig. 1). The future of the industry depends mainly upon its ability to produce rabbit meat and fur in commercial quantities.

RABBIT MEAT AS FOOD

At present there are relatively few established markets where rabbit meat is displayed and regularly offered for sale. Consequently the meat is usually produced for home and local consumption, and the general public is not well acquainted with it. Once constant supplies are available, however, and the public recognizes its good qualities, the demand should substantially increase.

Rabbit meat is a good source of efficient protein and iron. Analyses made by the Bureau of Animal Industry of the Department of Agriculture show that it has about the same protein content as other lean meats. Of the four samples of rabbit meat analyzed, the average for protein was 20.4 percent, and for fat, 11.9 percent. The fuel value averaged 855 calories per pound. The rabbits studied were of the Chinchilla, American White, and New Zealand breeds and ranged in age from 10 weeks to 18 months.

In terms of live weight, rabbits afford about the same proportion of edible meat as do young broiling chickens, but the carcass of the rabbit contains a larger proportion of meat. Including the heart, liver, and

kidneys, the dressed carcass averages 56 percent of the live weight, and 82 percent of this is edible.

The edible organs, which constitute 5 percent of the live weight, should not be considered waste. Rabbit livers, especially, are palatable, and, like the livers of other meat animals and poultry, are valuable in the diet in helping to make red blood cells.

For use in his own home and in connection with efforts to popularize his product, the rabbit breeder will find it helpful to obtain a few copies of Leaflet 66, *Rabbit Recipes*, available at 5 cents a copy from

the Superintendent of Documents, Government Printing Office, Washington, D.C.

RABBIT SKINS FOR FUR

Regardless of size and color, all rabbit skins have commercial value. They are used more extensively by the fur trade than any other kind of fur, more than half the rabbit skins utilized being dressed and dyed and made into fur garments and trimmings for women's coats, suits, and dresses. The remainder, or skins not suitable for garments, are used as linings for men's and boys' gloves and in the manufacture of felt hats. Even the fine shreds into which the skins

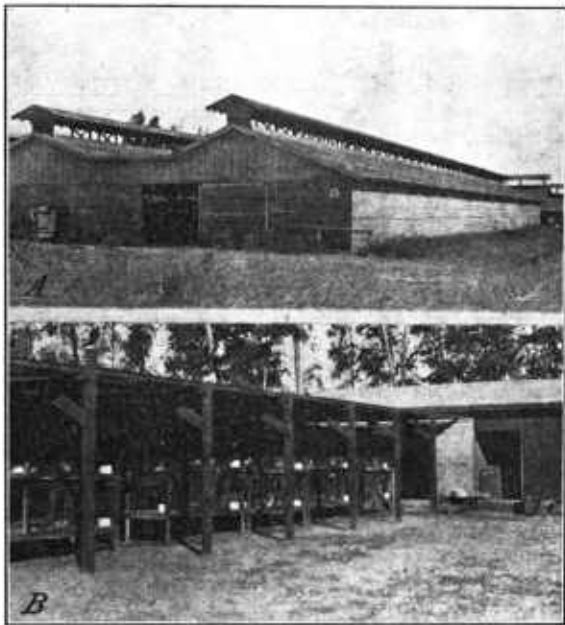


FIGURE 1.—Typical rabbitries: A, Breeding houses of large commercial rabbitry; B, small rabbitry, typical of many that are operated in various sections of the United States.

are cut in separating the fur for felting purposes are utilized in the manufacture of glue.

Many wild fur-bearing animals are disappearing from different parts of their former ranges, and rabbit skins are being substituted for those of wild animals in the manufacture of garments. Fur dressers and dyers have mastered so well the art of imitating other furs by modern methods of plucking, shearing, and dyeing that the pelt of the rabbit, which lends itself readily to imitation processes, is being offered for sale under a variety of trade names (p. 36). In many instances it is replacing such costly skins as ermine, seal, beaver, and leopard.

PROSPECTIVE PROFITS

Market prospects for rabbit meat and fur promise an encouraging future for the producer, but the business is not in the "get-rich-quick" class. Unwarrantedly large returns have frequently been predicted or promised to prospective investors, in spite of the heavy risks usually known to accompany such lures. The promoter who tries to impress

the prospective investor with statements of fabulous returns from raising rabbits, or with misleading endorsements, unwittingly admits that his offering cannot stand on its own feet.

Irresponsible sellers of rabbits often "guarantee" that certain profits will be made or dividends paid, or even that they will buy back or resell when the purchaser wants his money. Such guarantees can be depended upon only when their makers have sound financial backing. Promises of this nature, which are made to establish confidence and lull suspicion, should put the prospective purchaser on his guard. They indicate a special need to investigate not only the securities offered but also the responsibility of the guarantor.

It is unwise for the beginner to make hasty investments in rabbits. Although good profits are obtained from the sale of breeding animals, the exceptional prices are usually received only by experienced breeders. Even though the sale of breeding animals may in some cases net the owner more than marketing the rabbits as food, a beginner should never lose sight of the fact that rabbits are raised primarily for food and fur. Before he enters the industry, one who hopes to obtain an adequate return on his investment over a period of years should carefully consider the economic side of the problem. Success is largely dependent upon quality of animals, economy of production, and efficient marketing.

UNITED STATES RABBIT EXPERIMENT STATION

The recommendations made in this bulletin are based largely on findings at the United States Rabbit Experiment Station, established and maintained at Fontana, Calif., by the Bureau of Biological Survey, in cooperation with the Fontana Farms Co. and local rabbit breeders. At this station improved methods are developed for producing rabbits with meat and fur of fine quality, for insuring sanitary surroundings, and for preventing outbreaks of parasitic and other diseases. Although the work is conducted in the one locality, the fundamental principles developed are applicable in any section of the country.

The equipment of the station, on the site of a 5-acre orange grove, includes an administration building containing offices and laboratories (fig. 2); various open and closed types of houses sheltering hundreds of hutches and cooled on hot days by a sprinkler system; the director's residence; and a large storage house where hay and grain are kept and prepared for feeding. A carpenter shop, a garage, a small slaughterhouse, and a concrete manure pit complete the lay-out. When established in 1927 the station accommodated 140 animals, but additional equipment has made it possible to provide for 620.



FIGURE 2.—Administration building, United States Rabbit Experiment Station, Fontana, Calif.

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Various groups of breeders hold monthly meetings in the administration building to discuss problems pertaining to rabbit raising. Other groups desiring to use the station's facilities for this purpose may communicate with the director, United States Rabbit Experiment Station, Fontana, Calif. Fontana is accessible from Los Angeles on the Pacific Electric and the Santa Fe Railroads or by automobile.

THE RABBITRY AND ITS EQUIPMENT

The kind of buildings needed for a rabbitry depends upon the location, the climate, and the money to be invested. Whatever the extent of the business, the producer should plan for construction and equipment that will facilitate handling the animals with a minimum of manual labor. Care in feeding, breeding, and handling the rabbits, as well as in cleaning the hutches and keeping the house sanitary, is of the utmost importance. Construction, therefore, should be as simple as possible, and ample provision should be made for light and for fresh air.

In mild climates little or no protection is required other than a good roof, and the sides of the hutches may be constructed either wholly or in part of wire netting. Where there is much cold weather, additional protection must be provided. This may be achieved by enclosing the sides and back of each hutch with wood or by placing the hutches in a shed or other shelter. Rabbits must also be protected against extremes of heat. This may be done by placing the hutches in the shade of trees or shrubbery, or under the shade of lattices. Protection against rain, too, must be provided, for rabbits cannot stand exposure that results in the coat becoming thoroughly wet.

HUTCHES

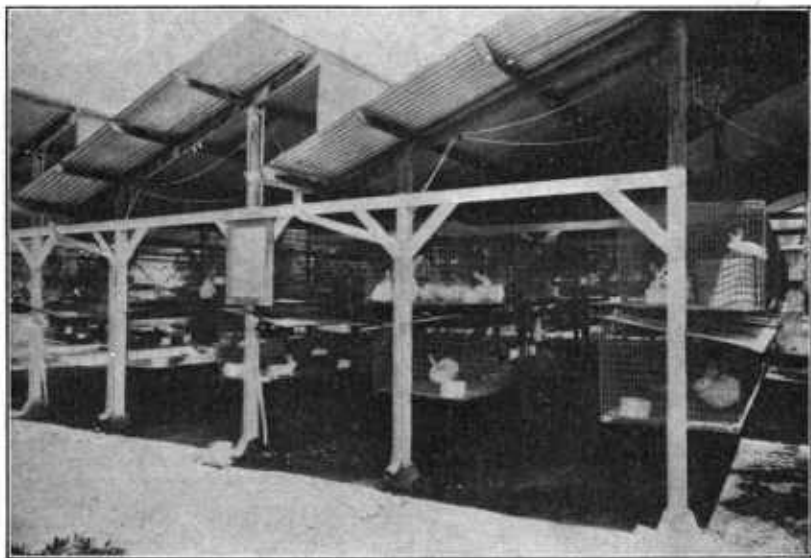
To provide individual quarters for each mature animal, rabbit hutches should have about 10 or 12 square feet of floor space. The usual hutch is 4 feet long, 2½ feet deep, and 2 feet high, inside measurements, although hutches for Flemish Giants are frequently 5 or 6 feet long. Where there is plenty of room the hutches should be in single tiers. Using more than two tiers makes it inconvenient to reach and clean some of the hutches, and the animals in them are more difficult to observe. Great strength is not required in hutches, as rabbits seldom make determined efforts to escape. The animals are more easily cared for and less likely to become diseased in well-built hutches, however, than in poorly constructed temporary ones, which become foul unless frequently cleaned and rebedded with straw, leaves, or other absorbent. Self-cleaning hutches (fig. 3) need no bedding and are easily kept in good condition.

Hutches should be so located in the rabbitry as to prevent unusual excitement. Domestic rabbits are quiet in nature and enjoy being undisturbed, especially during the middle of the day.

Many different types of hutches have been used, but the most satisfactory are (1) the semi-enclosed hutch constructed with ends and back of wood, for use in colder climates; (2) the open-air wooden hutch, consisting of a wood frame with front, back, and ends of wire, usually 1-inch-mesh woven poultry wire; and (3) the all-metal hutch. If tightly built shelters are used, the open-air and the all-metal hutches

are satisfactory in colder climates, but they are particularly suitable for use in mild climates.

With either of these hutches any of three general types of flooring may be used: (1) Wooden slats varying in width from 1 inch to 1½ inches and in thickness from one-half to three-fourths of an inch, spaced approximately one-half inch apart; (2) either perforated metal, or galvanized hardware cloth, ½-, ⅝-, or ¾-inch mesh, no. 15 to no. 18 gage, having a bottom support; or (3) solid boards having a slope toward either the front or the back. The perforated metal floor provides the rabbit maximum comfort and permits effective treatment with fumigants and disinfectants.



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FIGURE 3.—Self-cleaning hutches at the United States Rabbit Experiment Station. Feeding and watering, as well as cleaning, are facilitated by using hutches of this type. See also figure 4.

ALL-METAL HUTCH

Domestic rabbits, confined in rather small quarters, often become restless and gnaw exposed surfaces of wood or other readily destructible material within the hutch. In such cases repairs are needed more or less continuously, the hutch looks unattractive, and sometimes unsanitary conditions develop. As a solution for this problem, the all-metal hutch (fig. 4) has been designed.

Use of metal exclusively in hutch construction seemed impractical until recently because of the large investment required. Now, however, electro-spot-welded wire fabric provides a suitable and relatively inexpensive material. Several types of rabbit hutch constructed of this fabric are manufactured and sold, and the Rabbit Experiment Station has designed all-steel hutches that can be economically constructed of stock materials by anyone with mechanical ability.

Convenient, two-compartment hutches as illustrated in figures 5 and 6 can be made for the most part of electro-spot-welded wire fabric.

In 24-inch widths this material can be used for the sides and ends. Labor can be saved by using one length of the wire fabric for all sides, bending it at the corners, but if separate pieces are cut for front, back, and sides these can be fastened together at the corners with spiral wire or a soft galvanized stovepipe wire of about 12 gage. In the same way the sides and ends after assembling can be attached to a bottom of either galvanized $\frac{5}{8}$ -inch-mesh hardware cloth or perforated metal sheets (p. 5). If a sloping roof is used on the hutch, as is required for

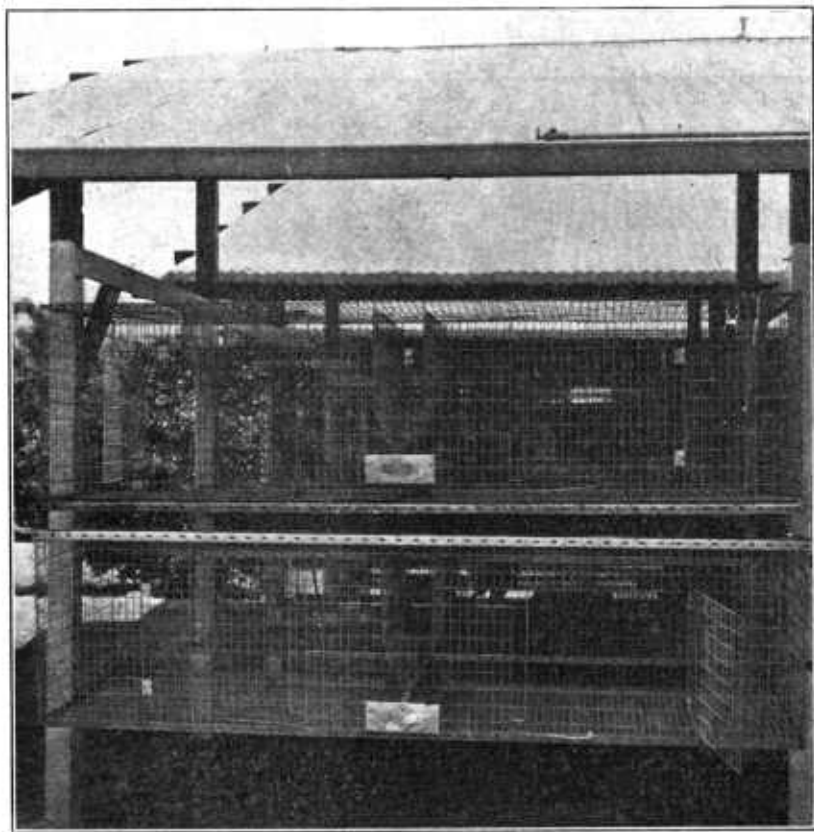


FIGURE 4.—All-metal hutches. See also figure 3.

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lower sections in tier installation, the end sections are bent to the desired pitch and this also provides additional rigidity. The top can be made of either electro-spot-welded wire fabric or galvanized sheet iron. The hay manger between the two compartments can also be constructed of the same materials, as shown in figure 5. The fabric can be cut as desired to provide openings for doors and feed trough, and permit access to the hay manger. Methods of constructing a wire lock or fastener, hinges, and partitions beneath the hay manger are illustrated in figure 6. Metal frames constructed of

1½-inch angle iron can be used in installing hutches to give additional support to the bottom. Figures 3 and 11 illustrate the two-tier arrangement of these hutches.

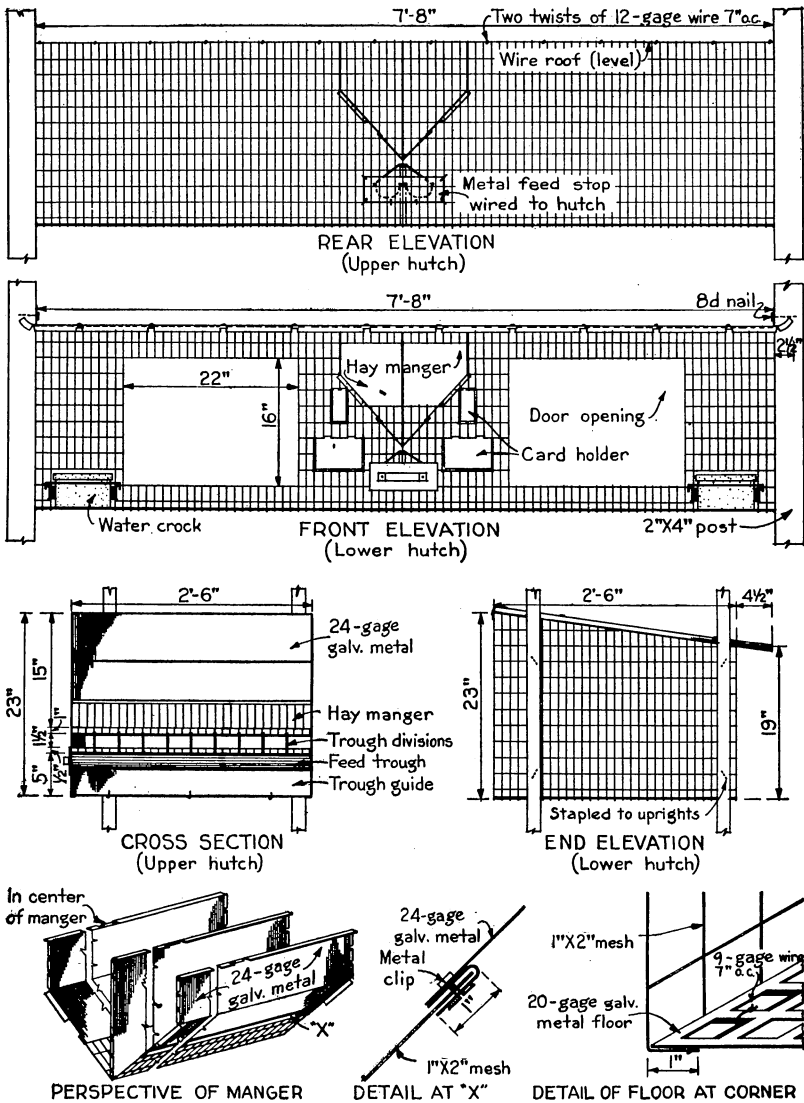


FIGURE 5.—Construction details for all-metal rabbit hutches. (Prepared by Bureau of Agricultural Engineering.)

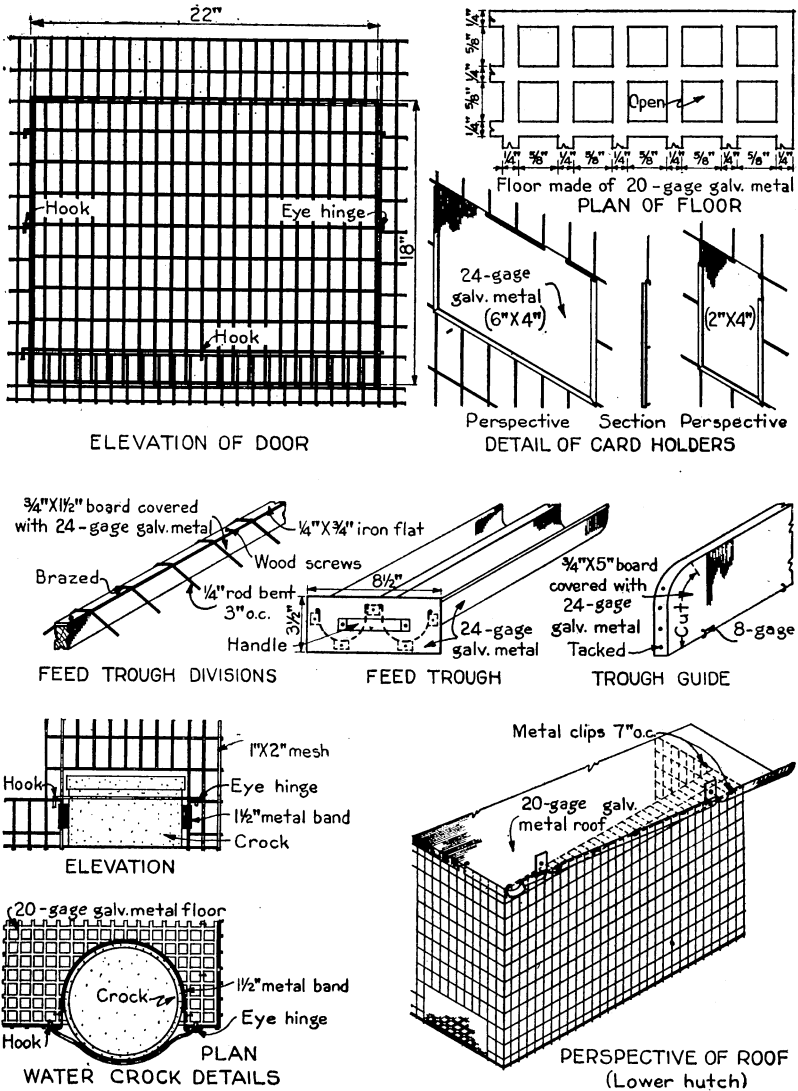


FIGURE 6.—Additional construction details for all-metal rabbit hutch. (Prepared by Bureau of Agricultural Engineering.)

Bill of materials.—As shown in figures 5 and 6, 2 all-metal hutches (1 upper and 1 lower) can be constructed of the following materials:

Wire fabric.—All wire fabric should be electro-spot-welded, 12½-gage, 2-inch vertical mesh, and 1-inch horizontal mesh. The following quantities are required:

51 linear feet, 24 inches wide, for roof and walls.

8 linear feet, 24 inches wide, for doors.

Galvanized sheet steel.—Wherever practical the edges of the galvanized sheet steel used should be turned under ¼ inch for stiffness. The following quantities are required:

- 1 sheet 24-gage, 4 feet by 8 feet, cut into the following pieces:
 - 4 pieces, 13 inches by 2 feet 8 inches, for sides of hay manger.
 - 2 pieces, 16 inches by 2 feet 8 inches, for center of hay manger.
 - 4 pieces, 1½ inches by 18 inches, for crock straps.
 - 4 pieces, 2 inches by 2 feet 6 inches, for manger mesh guard.
 - 4 pieces, 7 inches by 5 inches, for breeding-record cards.
 - 4 pieces, 3 inches by 5 inches, for feed-record cards.
 - 2 pieces, 1½ inches by 2 feet 6 inches, for feed-trough division.
 - 2 pieces, 12 inches by 3 feet 6 inches, for trough guides.
- 1 sheet 16-gage, 3 feet by 3 feet, cut into the following pieces:
 - 2 pieces, 4 inches by 9 inches, for front of feed trough.
 - 2 pieces, 1½ inches by 10½ inches, for feed-trough handles.
 - 2 pieces, 1 foot 3 inches by 2 feet 7 inches, for feed trough.
- 1 sheet 20-gage, 3 feet by 8 feet, for roof (not cut into pieces).

Galvanized sheet steel should be used for the floors of the hutches and should be perforated with ⅝-inch square holes ⅝ inch on centers both ways. The following quantity is required:

- 2 sheets, 20-gage, 2 feet 6 inches wide by 7 feet 8 inches.

Wire will be needed as follows:

- 5 linear feet, 12-gage galvanized soft wire, for lacing.
- 7 linear feet, 9-gage copper wire, for lacing.
- 2 linear feet, 8-gage copper wire, for lacing.

Miscellaneous.—The following additional materials will be needed:

- 2 pieces of strap iron, ¼ inch by ¼ inch by 2 feet 6 inches, for feed-trough division.
- 18 pieces ¼-inch-diameter iron rods, 10 inches long, for feed-trough division.
- 6 round-head wood screws, ⅝ inch by 1 inch, for feed-trough division.
- 16 large carpet tacks for trough guide.
- 53 brass clips or cotter pins, ⅝ inch by ⅝ inch, with flat heads (see detail "X" fig. 5).
- 4 common 8-penny wire nails.
- Sixteen ¾-inch staples, 9 gage.
- 2 pieces wood boards (yellow pine or other species), ¾ inch by 1½ inches by 2 feet 6 inches, for feed-trough division.
- 2 pieces wood boards (yellow pine or other species), ¾ inch by 5 inches by 2 feet 6 inches, for trough guide.
- 4 earthenware crocks 7 inches in diameter, 4 inches deep.

OPEN-AIR WOODEN HUTCH

Though not so durable as the all-metal hutch, the wooden hutch with woven-wire sides and ends permits good circulation of air and is more sanitary than a solid hutch. It can be constructed as shown in figure 7, of the following materials:

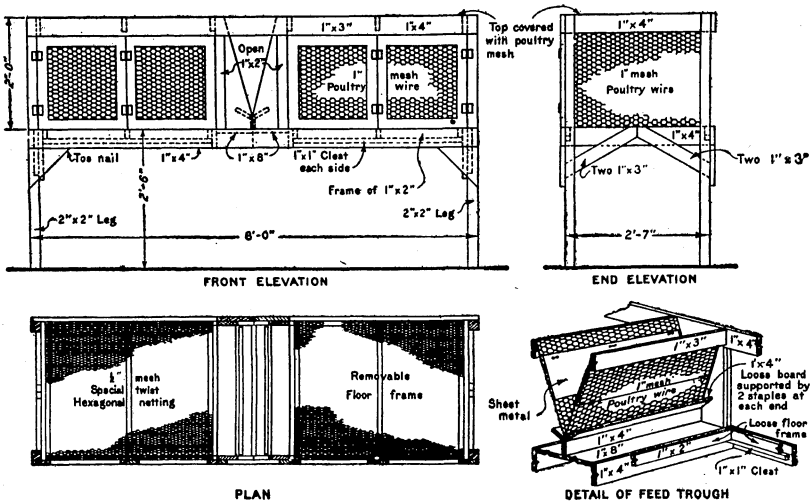


FIGURE 7.—Construction details for two-hutch unit of open-air wooden hutches.

- Four 2- by 2-inch by 4½-foot legs.
- Four 1- by 4-inch by 8-foot rails.
- Six 1- by 4-inch by 2½-foot crosspieces.
- Four 1- by 3-inch by 2½-foot crosspieces.
- Eight 1- by 3-inch by 1½-foot braces.
- Two 1- by 10-inch by 1-foot braces.
- Six 1- by 8-inch by 2-foot feed sections.
- Two 1- by 8-inch by 2½-foot feed sections.
- Two 1- by 2-inch by 2-foot feed sections.
- Three 1- by 4-inch by 2½-foot feed troughs.
- Four 1- by 1-inch by 3-foot cleats.
- Sixteen 1- by 2-inch by 1-foot 8-inch doors.
- Six 1- by 2-inch by 2½-foot flooring.
- Four 1- by 2-inch by 3-foot flooring.
- 6½ linear feet of ½-inch mesh, 30-inch special-twist hexagonal wire.
- 2 pieces of galvanized metal, 9 by 2½ feet.
- 4 pairs 1-inch hinges.
- 4 door fasteners.
- 6 linear feet of 1-inch mesh, 18-inch poultry wire.
- 18 linear feet of 1-inch mesh, 24-inch poultry wire.
- 8 linear feet of 1-inch mesh, 32-inch poultry wire.

NEST BOXES

The nest box (fig. 8) should be large enough to prevent crowding but small enough to keep the occupants warm by their own body heat. The top and bottom should be removable to facilitate cleaning.

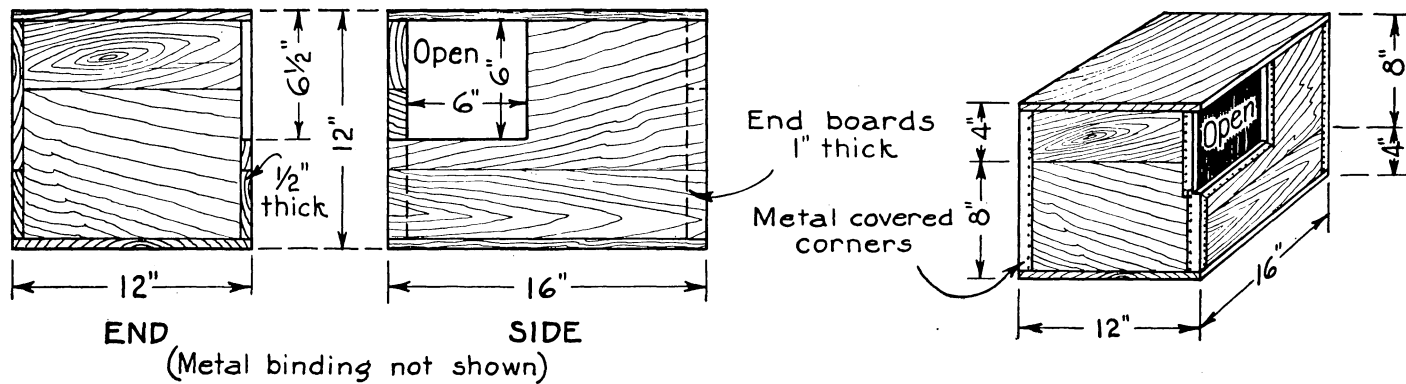
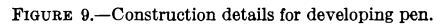


FIGURE 8.—Construction details for nest box.

DEVELOPING PENS

The primary purpose of developing pens is to afford places where weaned young can be carried with the minimum labor and equipment. The pens are particularly useful in housing young animals being grown out for breeders, fed out to a heavier market weight, or being retained a few days awaiting slaughter. Separate developing pens should be provided for bucks and does. As shown in figure 9, a developing pen can be constructed of the following materials:

- Ten 2- by 4-inch by 10-foot uprights.
- Nine 2- by 4-inch by 8-foot uprights.
- Two 4- by 4-inch by 10-foot uprights.
- Four 2- by 4-inch by 10-foot knee braces.
- Nine 2- by 4-inch by 8-foot corner braces and headers.
- Twelve 2- by 6-inch by 14-foot roof framing.
- Two 2- by 6-inch by 12-foot roof framing.
- Two 2- by 4-inch by 12-foot roof framing.
- Eight 2- by 4-inch by 14-foot rails.
- Twelve 1- by 6-inch by 14-foot baseboards and gates.
- Three 2- by 4-inch by 8-foot gates.
- Three 1- by 4-inch by 6-foot gates.
- Two 2- by 4-inch by 14-foot partitions.
- One 1- by 6-inch by 14-foot partition.
- 140 linear feet of 1-inch-mesh, 48-inch poultry wire.
- 3 pairs 4-inch strap hinges.
- 3 fasteners for gates.
- 22 sheets 26-gage galvanized metal roofing, 2½-inch corrugations, 2 feet 2 inches by 6 feet.
- 22 sheets same material 8 feet long.



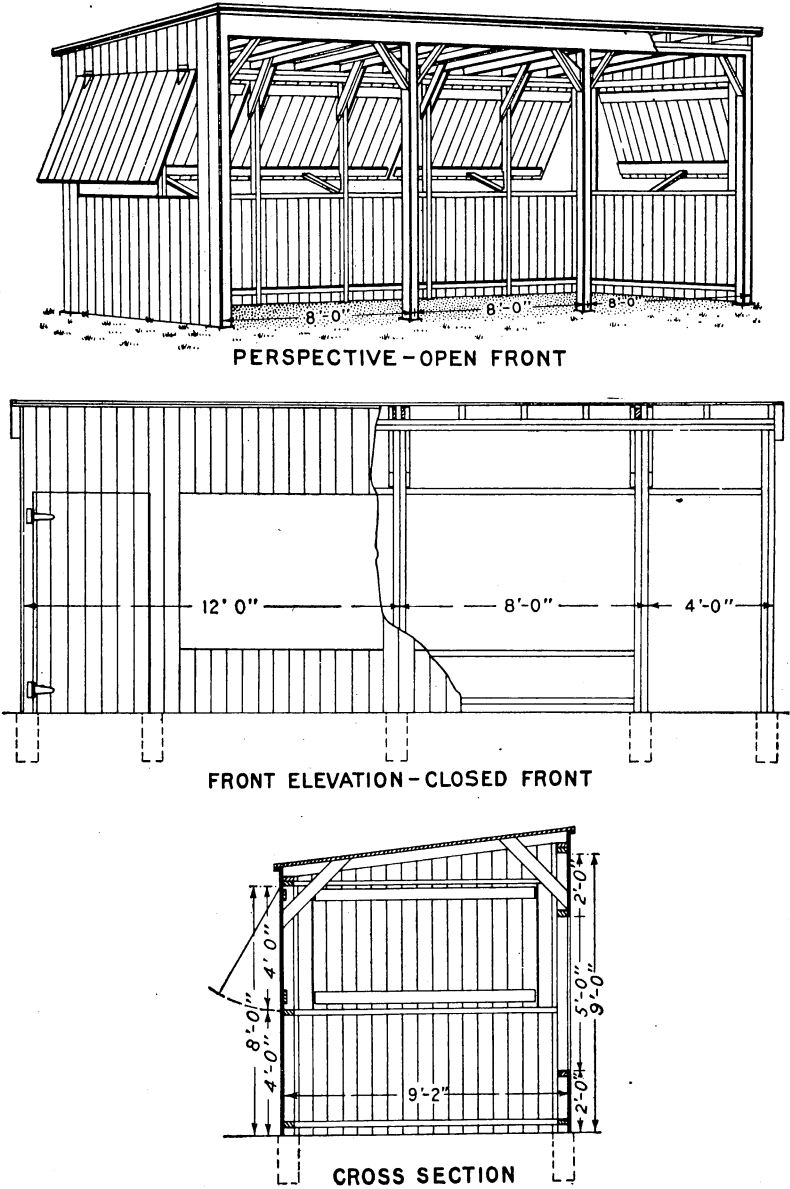


FIGURE 10.—Construction details for rabbit house.

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SHELTERS

Rabbit shelters or houses accommodating 50 to 100 breeding animals are preferable to larger ones, for in smaller groups rabbits are less likely to contract disease, and outbreaks are more readily controlled when the animals are kept in smaller units. The rabbit house shown in figure 10 can be constructed of the following materials:

- One-third of a cubic yard of concrete for post footings.
- Eight 2- by 4-inch by 9-foot posts.
- Nine 2- by 4-inch by 8-foot posts.
- Eighteen 2- by 4-inch by 8-foot plates and girts.
- Six 2- by 4-inch by 10-foot end girts.
- Thirteen 2- by 4-inch by 10-foot rafters.
- Fourteen 1- by 6-inch by 3-foot braces.
- Sixty 1- by 6-inch by 8-foot tongue-and-groove sheathing (rear).
- Forty 1- by 6-inch by 9-foot tongue-and-groove sheathing (ends).
- Two 1- by 8-inch by 12-foot rear facias.
- 280 feet board measure roof sheathing.
- 70 linear feet 1- by 1-inch material for under edge of roof.
- Prepared roofing for 260 square feet.
- 6 pairs 6-inch T hinges.
- For open-front shelter add the following:
 - Six 2- by 4-inch by 3-foot braces.
 - Two 1- by 8-inch by 12-foot facias.
 - Fourteen 1- by 4-inch by 9-foot post casings.
- For closed shelter add the following:
 - Two 2- by 4-inch by 9-foot posts.
 - Seven 2- by 4-inch by 8-foot girts.
 - Twenty 1- by 6-inch by 10-foot tongue-and-groove sheathing.
 - Thirty-two 1- by 6-inch by 5-foot tongue-and-groove sheathing.
 - Six 1- by 6-inch by 3-foot braces.
 - 2 pairs 6-inch T hinges.

The rabbit shelter for which construction details are shown in figures 11 and 12 (see also fig. 3) has a distinct advantage in that additional sections can be added as needed. A concrete floor may be provided with gutters so situated that it can be readily washed clean. Where a corrugated metal roof makes the shelter too hot, composition shingles or rolled roofing may be laid over solid sheathing, the 2- by 4-inch rafters in such cases being placed on centers at 2-foot intervals to support the sheathing. Enclosing three sides or making other adaptations for climatic conditions may also be necessary. Materials needed for the shelter are listed on page 18.

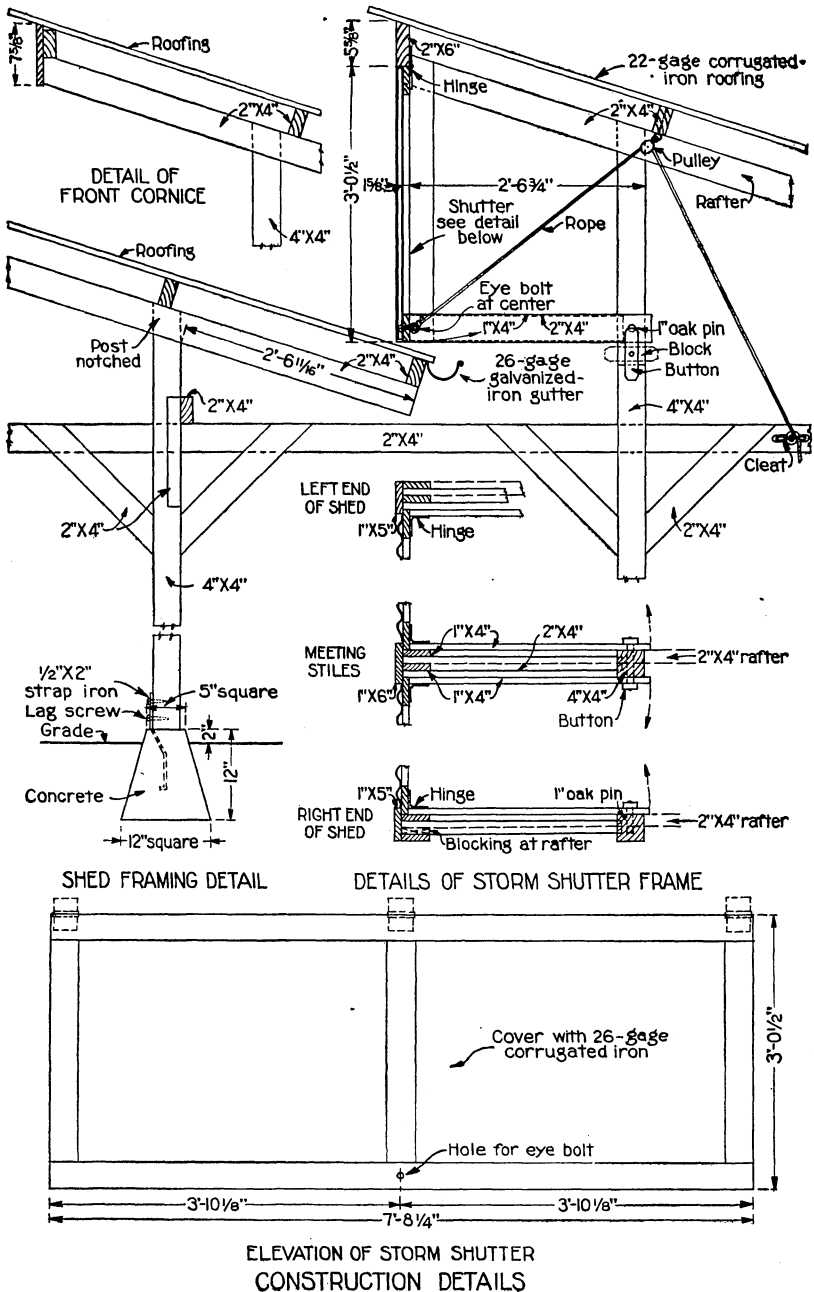


FIGURE 12.—Additional details for rabbit-hutch shelter. (Prepared by Bureau of Agricultural Engineering.)

BILL OF MATERIALS FOR RABBIT-HUTCH SHELTER

- 5 sacks of cement, three-eighths of a cubic yard of sand, and three-fourths of a cubic yard of gravel for 0.8 cubic yard of concrete for post footings. (Use 1 part Portland cement to 2 parts of sand and 4 parts of gravel. In localities where frost action is a consideration the footings should be placed below the frost line and be 8 by 8 inches in cross section. If the footings are 8 by 8 inches by 2 feet 8 inches the following materials will be needed: 10 sacks of cement, three-fourths of a cubic yard of sand, and 1½ cubic yards of gravel. Precast footings cost less than those cast in place.)
- Thirty-six ¼- by 1½- by 16-inch strap irons, one end drilled for two ¾-inch lag screws.
- Seventy-two ¾- by 4-inch lag screws.
- Eighteen 4- by 4-inch by 10-foot posts.
- Eighteen 4- by 4-inch by 8-foot posts.
- Three 2- by 4-inch by 14-foot crossties.
- Twelve 2- by 4-inch by 12-foot crossties.
- Seven 2- by 4-inch by 16-foot longitudinal ties.
- One 2- by 4-inch by 8-foot longitudinal tie.
- Ninety 2- by 4-inch by 2-foot knee braces.
- Eighteen 2- by 4-inch by 12-foot purlins.
- Twenty-six 2- by 4-inch by 16-foot rafters.
- Thirteen 2- by 4-inch by 8-foot rafters.
- Five 2- by 6-inch by 16-foot facias.
- Two 1- by 8-inch by 16-foot facias
- One 1- by 8-inch by 8-foot facias.
- Eight 1- by 5-inch by 3-foot facias.
- Four 1- by 6-inch by 3-foot facias.
- Twelve 2- by 4-inch by 2-foot 6-inch struts.
- Twenty 1- by 4-inch by 2-foot 9-inch hangers.
- Twenty-four 1- by 4-inch by 3-foot 3-inch hangers.
- Seven 1- by 4-inch by 12-foot blocks.
- Thirty 1- by 5-inch by 8-foot pieces for shelter frame.
- Twelve 1-inch oak pins 7 inches long.
- One 1- by 2-inch by 10-foot piece for buttons.
- Fifty 3- by 3-inch hinges with screws.
- 20 round-head screws 2½ inches long with washers for holding buttons.
- Ten ¾- by 1½-inch eyebolts, 1-inch eye and nut.
- 10 screw eyes (1-inch eye) or heavy staple.
- 10 swivel pulleys for ¼-inch rope.
- Ten 4-inch cleats for ¼-inch rope, with screws.
- 90 linear feet ¼-inch sash cord.
- 120 linear feet 4-inch gutter with hangers.
- 38 linear feet 3-inch downspout.
- 6 turnouts for 3-inch downspout.
- Twelve 90° bends for 3-inch downspout. (All gutters and spouts to be of 26-gage galvanized metal.)
- 40 pieces corrugated roofing 3 feet long, 26 inches wide for shutters. (Plain galvanized metal, weather-resistant wall board, or ¾-inch tongue-and-groove ceiling could be used in place of corrugated metal.)
- 66 pieces corrugated roofing, 7 feet long, 26 inches wide.
- 66 pieces corrugated roofing, 6 feet long, 26 inches wide. (Roofing to be 24-gage, 2½-inch corrugations, and heavily galvanized; nails for securing roofing should be rust-resistant, providing security against leaks.)
- 18 pounds 16-penny common nails.
- 2 pounds 8-penny common nails.
- 1 pound 8-penny finishing nails.
- 5 pounds 10-penny common nails.
- 10 gallons of paint for woodwork (three coats).

STOCKING THE RABBITRY

The beginner in rabbit raising may start with young rabbits just weaned, or with mature animals. When young are used for foundation stock, the breeder has an opportunity to become acquainted with his animals and their habits before they reach the production stage. In selecting stock it is always to be remembered that rabbits are raised

for both meat and fur, and under ordinary circumstances meat is the more important.

When purchasing breeding stock, it is better to deal directly with reliable breeders; brokers handling live rabbits are seldom able to vouch for the conditions under which their animals were produced. Reliable breeders will always stand behind the stock they offer and will give references. National, State, and local rabbit-breeders' organizations can furnish names and addresses of breeders from whom stock can be purchased, and further inquiries can be made of local chambers of commerce and better-business bureaus. It is contrary to the policy of the Department of Agriculture to vouch for the integrity or the financial standing of any individual or company.

The essential requirements of good foundation stock are: (1) Health and vigor, (2) ability to reproduce profitably, and (3) type and conformation consistent with ability to produce marketable offspring of high quality and the desired size. Animals deficient in vitality, even though free from disease, cannot be expected to produce young profitably.

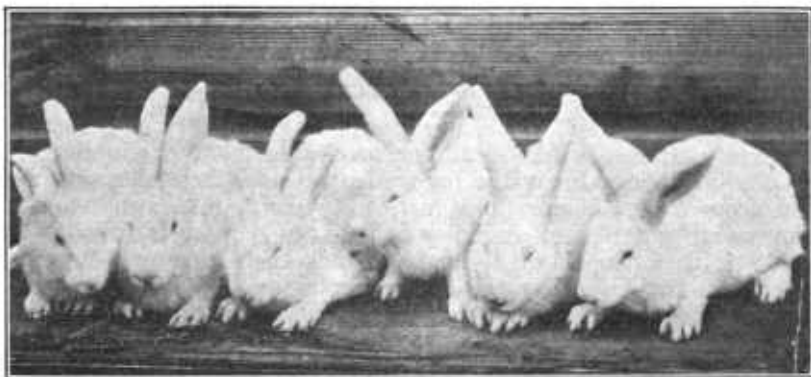


FIGURE 13.—A litter of healthy, vigorous young rabbits of good conformation.

COMMON BREEDS

Although the American Rabbit and Cavy Breeders Association has set up 51 different standards for breeds and varieties of rabbits, the beginner should make his selection from only 6 or 8 breeds. Fine distinctions will only be confusing to him, and from a utility standpoint a large number of breeds and varieties will be a handicap to the proper development of his own business and also to that of the industry. The rabbits best suited in size and conformation to the commercial production of meat and fur are the medium and larger breeds, such as Flemish Giant, New Zealand, American, Beveren, French Silver, and Chinchilla. White rabbits that are satisfactory meat producers are most desirable (fig. 13) because their fur usually brings higher prices in the large markets. The preference among such white breeds is largely a matter of personal choice.

CHINCHILLA RABBITS

The Chinchilla rabbit, a comparatively new breed, especially in the United States, has been widely heralded as a "fur rabbit", perhaps more than any other breed, and many exaggerated and misleading

statements have been made regarding the value of its fur and the large profits to be derived from the sale of the pelts. This has had a tendency to create a false impression and has led many to invest large sums in breeding stock, only to learn that the claims made were exaggerated. The color of the pelt of the Chinchilla rabbit is especially attractive, and this is responsible in large measure for the widespread popularity of the breed. The price paid for skins by the large fur buyers, however, is not sufficient to justify many of the assertions that have been made or to enable one to engage in breeding these rabbits for their fur alone; they must be bred for both meat and fur. It is important that breeders pay special attention to commercial rather than fancy qualities. The fur should be a rich, even, uniform shade of soft, bluish gray, free from any brown or rusty tinge, and interspersed with long hairs (commonly called guard hairs) tipped with jet black and so arranged as to give a wavy effect. The chest and flanks may be a lighter shade, but an even, harmonious blending of color in all sections is desirable. The underfur at the base should be slate blue and the intermediate color ashy gray, merging into pearl gray, with black and white at the ends of the hairs. The belly should be bluish white on the surface, and its under color should be a deep, rich blue.

ANGORA RABBITS

The Angora rabbit, much advertised by promoters as a source of fabulous fortunes, is too small for profitable meat production, and its skin has little value in the fur trade. It does, however, produce a wool from 5 to 8 inches long within a year's time, and when the commercial practice of shearing four times a year is followed the wool attains a length of $2\frac{1}{2}$ to $3\frac{1}{2}$ inches each quarter. A mature animal not suckling young will shear on an average about 12 ounces a year. The wool is reported to be unusually warm and light when made into garments, but owing to its cost and its fluffy nature it is used mostly in conjunction with other fibers. Conducted carefully and conservatively, Angora raising has a proper place in our agriculture, but such fortunes as those promised by some promoters cannot be realized from it. This kind of propaganda has already done considerable damage to the business.

In general Angora rabbits are cared for in the same way as are other rabbits, but in addition considerable labor is required to keep the wool on the rabbits brushed out or blown free from matting and foreign material. Pregnant does should not be sheared over the belly, for they use some of this wool in making nests.

FEEDING PRACTICES

KINDS OF FEED

To produce good meat and fur, rabbits must be furnished wholesome feeds that are relished and at the same time are available at reasonable cost. Proper feeding is also an important factor in keeping the animals healthy and thereby lessening losses from disease. Rabbits have been fed all kinds of grains and mash, various hays, and green stuff ranging from tubers to lawn clippings. The principal concentrates fed are barley, oats, and wheat (rolled or ground): cracked corn, kafir, linseed meal, peanut meal, and soybean

meal. Other feeds often used are wheat bran, rice bran, beet pulp, and molasses. Alfalfa, clover, soybean, oat, and timothy are the principal hays fed. Of these, alfalfa and clover are used most extensively. High-quality alfalfa or other leguminous hay constitutes an important part of the rabbit ration. In fact, the work carried on at the United States Rabbit Experiment Station shows that the best results are obtained with breeding does when about 60 percent of the ration is made up of good-quality legume hay.

NUTRITIVE RATIOS

Economical and profitable feeding can best be obtained by balancing rations according to the three nutrients of feeds—fats, carbohydrates, and proteins. Tables showing the nutrients for various feeds are included in texts on principles of feeds and feeding. Fats and carbohydrates are fat-producing and energy-producing constituents, fats being two and one-fourth times more valuable in this respect than carbohydrates. Protein develops lean tissue, hair, and connective tissue. Corn, wheat, barley, and oats are especially rich in fats and carbohydrates. Alfalfa hay, clover hay, peanut meal, soybean meal, and linseed meal are rich in protein and also are palatable to rabbits, but timothy hay, wild hay, and other carbonaceous roughages are somewhat unpalatable.

Since feeds that are richest in protein are the most expensive, the relative proportion of this nutrient to the combination of fats and carbohydrates should receive primary consideration. This proportion for any feed, known as the nutritive ratio, is found by multiplying the percentage of digestible fats by $2\frac{1}{4}$, adding to this the percentage of digestible carbohydrates, and then dividing this sum by the percentage of digestible protein, as in the following formula:

$$\text{Nutritive ratio} = \frac{\text{Digestible fats (\%)} \times 2\frac{1}{4} + \text{digestible carbohydrates (\%)}}{\text{Digestible proteins (\%)}}$$

In stating nutritive ratios, protein is always expressed as 1.

A relatively narrow nutritive ratio—that is, a ratio of 1:3.8 or less—seems to give most satisfactory results for does suckling young. A recent analysis at the Rabbit Experiment Station shows, for instance, that rabbit's milk contains more than twice as much total solids as cow's milk, about four times the protein and fat, and three times the ash, but only one-sixth as much lactose.

MINERALS AND VITAMINS

Little definite information is available concerning the mineral requirements of rabbits, but unquestionably a mineral deficiency is less likely if the animals are supplied a wide variety of feeds, including green stuff, and if 60 percent of the ration is good-quality alfalfa hay. Since feeds from different sections have varying mineral contents, odorless bone meal to the extent of 1 percent of the grain ration may be added, at little cost, to insure an adequacy of minerals at all times.

These feeding practices will also usually supply vitamins in the required variety and quantity. For this purpose it is especially important that the alfalfa hay be bright green and leafy and that lawn clippings, freshly cut alfalfa, garden vegetables, or other green feeds be included in the daily ration.

SUGGESTED RATIONS

Of the total feed for does nursing young, legume hay and such succulent feeds as carrots, green alfalfa, wild oats, and green barley may comprise 60 percent—45 to 50 percent of legume hay and 10 to 15 percent of succulent feeds. When no succulent feeds are available, legume hay should constitute the full 60 percent. The remaining 40 percent may consist of either of the following grain mixtures:

No. 1

40 pounds rolled oats.
25 pounds wheat bran.
20 pounds rolled barley.
14 pounds peanut meal (unadulterated).
1 pound odorless bone meal.

No. 2

25 pounds rolled wheat.
25 pounds coarsely ground yellow corn.
25 pounds rolled oats.
24 pounds soybean meal.
1 pound odorless bone meal.

Both of these concentrate mixtures give the nutritive ratio of 1:3.89. As this ratio is identical with that of alfalfa hay, the quantity of hay supplied with these mixtures will not affect the nutritive ratio of the total feed. Peanut meal and soybean meal may be used interchangeably, but if linseed meal is substituted, the quantity of meal in the mixture should be increased 60 percent in order to keep the nutritive ratio the same. In other words, the value of linseed meal as a protein supplement is five-eighths that of the same quantity of peanut or soybean meal.

Salt should also be provided, either by keeping a salt spool in the hutch or by adding a pound of salt to a 100-pound grain mixture.

The same feeds or combinations of feeds and the same feeding methods should be continued without sudden changes. This does not mean that the same kinds of feed should be given during every season of the year, but rabbits may be "thrown off their feed" by such radical changes as occur when a breeder suddenly adopts a new ration on learning of another's success with it.

PREPARATION OF FEED

Grains for rabbits should be reasonably soft and crumbly, but never hard or in the form of powder. It is preferable to use crushed or rolled barley, oats, and wheat. Grain mixtures may be fed either dry or moist. If a moist mixture is desired, a small quantity of scalding-hot water may be added and thoroughly mixed with the grain until the fine particles adhere to the larger grains and the whole is of a crumbly consistency. The mixture should never be moist enough to be soggy or sticky; to avoid this, use scalding-hot rather than cold water.

Another method of moistening the grain mixture is to soak whole grains of wheat, oats, or barley overnight or from one feeding to another, then drain the water from the grains, add the rest of the dry-grain mixture, and thoroughly mix it with the soaked grain.

If alfalfa is fed whole, a considerable quantity will be wasted, because the rabbit will pull out a stem, eat part of it, and drop the rest. To avoid this wastage the general practice is to cut the hay into 3- to 4-inch lengths before feeding. A convenient home-made equipment for this purpose is shown in figure 14, the use of which eliminates the dust and the leaf shattering incident to chopping with an ordinary green-feed cutter.

QUANTITY OF FEED AND FREQUENCY OF FEEDING

Many breeders feed their rabbits too much. Giving a limited quantity of grain and hay at each feeding is more satisfactory than permitting access to feed at all times. Rabbits eat more at night than during the day and, therefore, it is advisable to feed the bulkier portion of the ration at night. Feeding grain in the morning and hay in the evening is satisfactory for young growing stock, resting does, and bucks. Does that are nursing require additional grain in the evening. The ration for each rabbit depends on the season and on the animal's age, appetite, and condition. Adult rabbits should be fed fairly heavily just before and during the breeding season, so that they may be vigorous. Nursing does and young rabbits that have been weaned should be fed liberally. The appetite is a good index to feeding. The quantities fed should be regulated, so that the rabbits may remain active and show eagerness to eat at mealtime.

The season should be given due consideration in feeding operations. It is well to change the plan of feeding in summer, because rabbits need less food in hot weather. The animals should be watched closely, and if they begin to show a disinclination to eat, the quantity of feed supplied should be reduced. During the heat of the day they show little interest in concentrated rations. Green feeds are especially relished then, and these add freshness to the diet.

The beginner, instead of guessing or estimating, will do well to follow a rule in determining the quantity of feed to give his rabbits daily. A good general rule is to supply $2\frac{1}{2}$ to 6 ounces of hay and 1 to 2 ounces of grain daily to mature does without young, to mature breeding bucks, and to growing young stock of both sexes. Does



FIGURE 14.—A cheap and convenient device for cutting hay into short lengths.

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that have just kindled may receive a slight increase in the grain and hay ration to supply their requirements for milk production, and as the young grow and develop, further increases in the grain and hay should be made.

Following a good system enables the rabbit breeder not only to feed properly and economically, but also to determine in advance the quantities of feed required for any period. The Rabbit Experiment Station has found that when hay constitutes 60 percent of the ration, approximately 300 pounds of feed a year are required to maintain each doe and raise her four litters to 8 weeks of age. Similar experiments at the station have shown that approximately 30 pounds of barley or oats and 115 pounds of alfalfa hay are required annually to keep a mature New Zealand buck at a satisfactory breeding weight.

BREEDING

The age at which the different kinds of rabbits may be bred varies with the time required by them to attain full size. In the utility breeds this is usually 7 or 8 months; in small breeds it may be 5 or 6 months. Successful matings may be made at any time within the breeding period, which usually lasts 13 to 15 days. The period of gestation is 31 days. Each doe should be bred four times a year, allowing 1 month for gestation and about 2 months to raise the young. It is not advisable to keep rabbits for breeding purposes after they are 4 years old.

The number of young in a litter varies greatly. Litters usually number 7 or 8, but they may contain 12 or more. When large litters are produced, however, only 7 of the best should be saved, unless the doe is an exceptionally good mother. If several does are bred at about the same time, it is possible to transfer some of the young from one to another, after proper marking for future identification.

Each breeding doe must have a separate hutch for herself and her young, and the buck must be kept by himself. One buck is sufficient for 10 breeding does. At mating time the doe should be taken to the hutch of the buck. The buck should never be put in the doe's hutch. When the doe is brought to the buck she should be held gently and quieted to prevent undue excitement. After service, the buck will usually fall over backward or on his side, and the doe should then be removed to her own hutch. If the doe does not voluntarily accept service within 4 or 5 minutes, she should be taken away and returned again the next day. A little practice will teach the operator the proper method of restraining the doe without interfering with voluntary acceptance of service. A buck and a doe should not be left together for long periods, as they are likely to fight and injure each other.

An accurate record of the date on which each doe is bred should be kept. A few days before the young are expected, the hutch should be carefully cleaned, and the nest box, containing plenty of hay or straw, placed inside. The doe will make her own nest. A day or two after the young are born she may be removed from the hutch a few minutes in order to examine the nest, to determine the number of young in the litter, and to remove any dead ones.

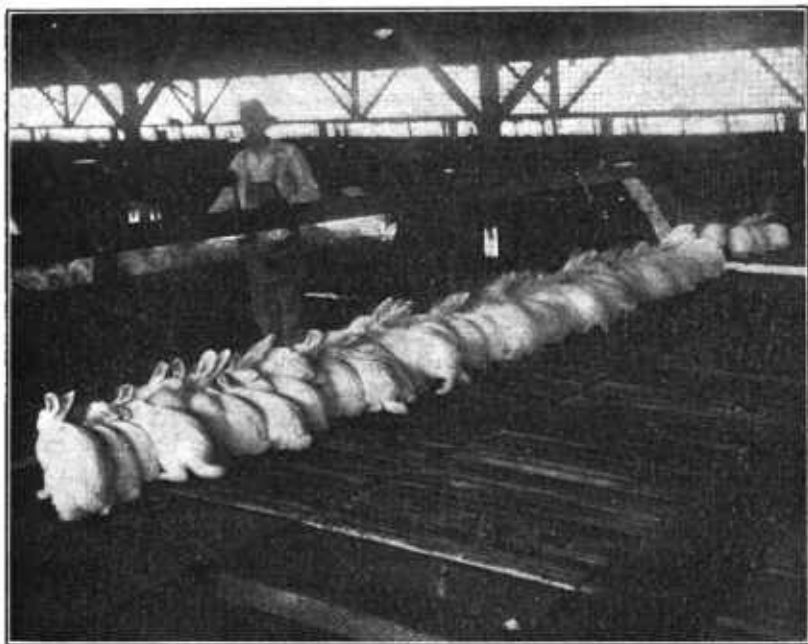
As too frequent handling of new-born young may cause the doe to disown or even to kill them, no other disturbance is advisable until

they are large enough to come out of the nest and run about the hutch. At this time the nest should be cleaned and fresh straw provided.

The young may be weaned when about 6 weeks old, but it is best to leave them with the doe until they are 8 weeks old. Males and females that are not marketed should be placed in separate hutches. A considerable number of young does may be kept together in the same open run until ready for marketing or breeding (fig. 15). The same is true of young bucks, though any that are unusually quarrelsome must be separated from the others.

IMPORTANCE OF HEREDITY

Certain fundamental principles of breeding evolved from years of scientific study and observation should be noted carefully. At



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FIGURE 15.—Young rabbits being kept together until ready for marketing. These young are uniform in size and other desirable qualities.

present the evidence indicates that environment has little to do directly with improvement of animal form, and that proper care and management practiced over several generations have no cumulative effect in developing a better breed of rabbits. Good feeding and care do, however, have the indirect value of providing a basis on which to select individual rabbits that because of their heredity will respond most satisfactorily to such care and management.

If improvement in rabbits is brought about, it must come chiefly through hereditary factors that are transmitted through the germ cells. Effort, therefore, should be concentrated toward improvement by so mating the animals as to recombine these factors in more desirable forms.

The facts in brief are: Thousands of factors, called genes, determine the inheritance of each individual. These are collected into groups like beads on a string or like little packets. The groups are called chromosomes, and the number of these in each cell is definite for each species. In the rabbit the number of chromosomes is 44, made up of 22 pairs. One of each pair comes from the father and the other from the mother.

The numerous breeds of rabbits, differing in size, color, and form, have resulted from various more or less stable combinations of these chromosomes. Frequent new combinations account for the off-type individuals cropping out within a breed and explain also the extreme variability noticeable in the newer breeds of rabbits as compared with older breeds that have eliminated most of the variable factors. The chromosomes frequently exchange genes, and this regrouping permits various recombinations, which are at once the hope and the despair of animal breeders. Without such variations there is no chance of improvement; with them there is no assurance of fixing a type without constantly selecting animals with desirable factors and discarding those with undesirable factors.

Another form of variation, though less common and less important from the breeder's standpoint, has produced types of some of the most important commercial varieties of rabbits. This is known as mutation, and an example is the rex type, in which the guard hairs are either shorter than the underfur or entirely absent. Rex is recessive to the normal coat, and consequently a normal-haired rabbit may possibly be a carrier of rex. Any breed can be "rexed" within three generations by proper matings, if a sufficient number of rabbits are produced. When the offspring of a normal-haired rabbit and a rex-appearing animal are bred together, 25 percent will be pure rex, and if a New Zealand white and a Castorrex are mated, about 1 out of 16 of the offspring will be both white and rex. One of the breeding experiments conducted by the Bureau of Biological Survey at the Rabbit Experiment Station has for its purpose the development of a white rex breed that will have the meat qualities of the older and better established meat breeds of rabbits.

Woolly, or long hair, is another mutation in rabbits. This, however, unlike the rex, is an undesirable trait. Woolly in rabbits is also a recessive, and consequently any of the rabbits that one suspects has the woolly character can be tested by mating it with a woolly appearing rabbit (and therefore pure for this character). If any young rabbits produced from this mating show the woolly character, one can be certain that the animal being tested is a carrier of woolly even though it is normal haired. Neither should be used in breeding.

SELECTION

Selection of the young of individuals or the individuals themselves that have splendid production records, called mass selection, may appear to be an excellent breeding policy, yet practice has shown that once the animals are on a fair production basis the productivity of a rabbitry may actually decrease when mass selection is practiced. The higher the plane of development, the less efficient this procedure becomes. A high-producing doe may herself carry the dominant genetic factors for high production, but together with these she may also

carry undesirable recessive factors that cannot come to expression in the doe herself but may be transmitted to her offspring. High-producing ability in the doe and the transmittal of this ability to all her progeny are different things.

A progeny test surmounts this difficulty. Briefly, a progeny test is the selection of those animals for breeding the majority or all of whose sisters are high and efficient producers. Not only is such an animal a high producer, but when properly mated it consistently passes this characteristic to the offspring. The progeny may be safely considered to have these factors for efficient breeding in a more or less pure state. All rabbit breeders should adopt the progeny test as a basis for the selection of their breeding stock.

INBREEDING

The United States Department of Agriculture receives many letters inquiring whether inbreeding is desirable; that is, mating rabbits that are closely related. The Department's answer is that the average rabbit raiser should not attempt inbreeding for the following reasons:

Inbreeding knows no favorites. It will intensify poor qualities just as readily as it will good qualities.

The average breeder has not the ability to judge exceptional qualities in his breeding rabbits, nor does he usually have the necessary knowledge of the previous history of his stock to know what results to expect.

Since the rabbits of the average breeder are usually of mixed inheritance, inbreeding such animals will always result in a variety of progeny.

Inbreeding is not harmful in itself, but it is sure, rapid, and effective in analyzing the genetic structure and make-up of living forms. It will always remain a most potent procedure in developing and improving any breed of rabbits, and, in fact, no procedure other than a close mating with rigid selection can be relied upon unfailingly to fix a type. Inbreeding is, however, a 2-edged sword, with which the ordinary rabbit raiser cannot afford to play. Discarding all undesirable forms, which is a necessary part of inbreeding, requires courage and considerable financial backing.

It would be a good thing for each rabbit-breeders' association to finance in some way the inbreeding of 2 or 3 of the best strains within each breed, with the intention of ultimately crossing these pure strains, and thereby developing a still better breed. This undertaking would be too expensive for the individual breeder, yet it has great potential value for every breeder. Breeders' associations could well finance such programs for the benefit of all the members.

MANAGEMENT PRACTICES

Just as in any other business, success in breeding rabbits depends upon efficient management. First of all the rabbit raiser should become thoroughly acquainted with his animals—their characteristics and behavior, their likes and dislikes. Consideration for the welfare of animals is always necessary for success in raising them. Proper arrangement of equipment, hutches, and buildings is also essential to efficient management.

HANDLING RABBITS

Care should be exercised in handling rabbits. In picking them up, the breeder should grasp the loose skin over the shoulders in one hand while placing the other hand under the animal as a support (fig. 16). Rabbits should never be picked up by the ears or the feet. When it is necessary to carry them any distance, it is best to place them in a carrying box.

MAKING A WORK SCHEDULE

As labor is one of the principal factors affecting success in raising rabbits, such operations as feeding, cleaning, handling, and marketing should be carried on in accordance with a definite plan or program. By having a definite time for each task and performing each one in a practical manner, one person should be able to care for approximately 250 producing does, the requisite number of breeding males, and the young replacement stock. In deciding upon a work schedule, the rabbit raiser will have to be governed by his own peculiar circumstances, but once his program is adopted it should be carried out regularly.

CARE OF STOCK IN HOT WEATHER

In almost all sections of the United States the high temperatures require some changes in the general care and management of rabbits in summer. Adequate shade should be provided to protect the animals during the hotter parts of the day, but rabbits should not be placed where they are totally excluded from sunlight during the cooler hours. Good circulation of air throughout the rabbitry is a necessity, and an abundant supply of water should be available at all times.



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FIGURE 16.—The proper way to handle a rabbit.

The first hot spell of the season is usually the period when the animals need most careful attention. They have not had time then to adjust themselves to the heat and are therefore easily overcome. There should be a thermometer hung for convenient reading in the rabbitry. When the temperature reaches 95° F. the rabbits should be watched carefully for evidence of distress, and in any case when the thermometer registers higher than 97° some precautions here recommended should be taken.

During hot spells rabbits can be protected by placing in the hutch an ordinary burlap sack folded and soaked in water. This makes a cool cushion. Hanging dampened burlap sacks around the hutch is also effective, and the rabbitry can be cooled by sprinkling the ground immediately surrounding the hutches. If even these methods are impracticable, it is advisable to provide small temporary pens in shady places on the ground. Animals taken from the hutches will find these pens refreshing during periods of excessive heat.

In parts of the country where high temperatures prevail throughout the summer, a sprinkler system is a worth-while permanent equipment for the rabbitry. There are various types of such systems on the market, and in many cases ordinary lawn sprinklers will serve

satisfactorily. In general, the result desired is to have the finest possible spray of water completely cover the area in which the hutches are located. This spray should fall from a distance of 5 to 6 feet above the hutches. Throughout the intense summer season it should be in use almost daily during the hotter portion of the day.

Does that have recently kindled or those about due to kindle will be most quickly affected by hot weather. They should be watched for signs of uneasiness, decided panting, or heavy breathing, and any so affected should be removed from the hutch and placed on the ground in the shade. Temporary pens should be handy for such occasions.

Litters of newly born young also need special attention. Failure to provide for the young on very warm days is often responsible for many deaths. Nesting material should not be allowed to become matted in the nest box as it then prevents free circulation of air. Burlap sacks dampened, folded, and placed under the nest boxes will help keep the young cool. If the boxes have removable covers, these should be taken off, at least during the greater part of the day. They may be replaced for the night.

DOES THAT DESTROY YOUNG

Individual does frequently destroy and eat their young. This abnormal appetite is sometimes due to feverishness caused by constipation following kindling, and undue handling or excitement during kindling may also result in such destruction. Proper feeding and handling during pregnancy will do more than anything else to prevent this tendency. A valuable doe that destroys her first litter should be given another chance, but if she continues the practice with subsequent litters she should be sold for meat.

DETERMINING AND SEPARATING THE SEXES

Male and female rabbits should not be kept in the same hutch or pen. To ascertain the sex of the young, open the aperture just in front of the anal opening by pressing with the thumb and forefinger. In the buck the organ will protrude.

EAR MARKING

In order to keep records of ancestry and thus make scientific matings possible, it is necessary to identify each of the breeding rabbits. Tattooing the ears has proved to be the most satisfactory method; it is permanent and does not disfigure the ears. Instruments for the purpose can be bought from biological supply houses. A good type is one in which separate lugs, with a series of numerals, can be inserted into a plierlike handle. Such an instrument perforates the inner surface of the ear at one operation. India or drawing ink is then rubbed into these small holes.

SANITATION

Rabbit breeders should always bear in mind that it is better to prevent diseases than to attempt to cure them. Most rabbit diseases are preventable, and this fact is of special importance because the causes of many are not definitely known. Losses may be avoided to a large extent by simple methods of cleanliness and management in maintaining health and vigor in the stock.

HUTCHES AND NEST BOXES

Keeping hutches, nest boxes, feed troughs, and water containers always clean will help prevent disease. It is essential, therefore, that they be so constructed as to be readily cleaned (p. 4). All refuse should be removed frequently rather than permitted to accumulate in the hutches or nest boxes. The droppings are a potential source of trouble because they may contain parasitic-worm eggs and disease germs. Feed troughs and water containers should be so placed that the rabbits cannot contaminate them with feces or urine.

Hutch floors should be constructed of $\frac{5}{8}$ -inch hardware cloth or of perforated metal flooring (p. 5), so as to permit the refuse to drain or drop to the ground. To facilitate cleaning, the nest boxes should be of the knock-down type (fig. 8).

RABBIT MANURE AS A BYPRODUCT

The proper use or the sale of rabbit manure may well be an important factor in the success of the rabbit industry. The character of food determines the richness of the manure in fertilizing constituents. Rabbits raised under intensive conditions are certain to produce a valuable fertilizer. The droppings may be collected and stored or immediately distributed on the land.

Care should be taken, however, in using rabbit manure on crops that are to be fed to rabbits. Where this practice is followed, advice should be obtained from State or Federal authorities regarding proper precautions for preventing parasitic or other diseases. A cheap and satisfactory method of sterilizing the manure is to place it in a wooden box connected with a steam jet. If coccidiosis is present in the rabbitry, the manure should not be put on any crops that will be fed to the rabbits.

TREATMENT OF DISEASE

Although maintenance of sanitary conditions and prevention of disease are thus functions of the rabbit breeder, treatment of disease calls for the services of a veterinarian. Special training is required for accurate diagnosis of disease and for administration of potent drugs, and usually the rabbit breeder is not equipped to do this sort of work.

As effective treatments are known at the present time for very few of the rabbit diseases, it is usually simpler and safer to destroy a few animals that are sickly than to attempt to treat them and run the chance of their spreading infection to healthy stock. This is especially true of animals with coccidiosis and snuffles. For further information on rabbit diseases and their treatment breeders may consult Farmers' Bulletin 1568, Rabbit Parasites and Diseases.

QUARANTINE

Infected animals that are to be treated should be isolated and housed in clean and disinfected quarters. The hutches from which they have been removed, their nest boxes, and their feed and water dishes should be cleaned and disinfected with a 3-percent compound cresol solution or a 5-percent carbolic acid or other suitable disinfectant.

Before newly acquired animals are placed in the rabbitry, they should be quarantined and examined thoroughly for any symptoms of disease. Special hutches for this purpose should be constructed and placed 50 to 100 feet from the place where the breeding stock is

housed. Similarly, rabbits returning from shows should be kept separate from all other animals for 3 weeks. If they have become infected with disease it will usually become apparent in that time.

PREPARING PRODUCTS FOR MARKET

CRATING AND SHIPPING LIVE RABBITS

Rabbits in good condition, properly crated, and provided with food and water can be shipped almost any distance with safety, but it is best not to ship them in extremely hot or cold weather. Crates should always be comfortable, well ventilated, and furnished with bedding of straw or leaves, not sawdust. Only one animal should be placed in one compartment of a shipping crate. Animals to be in transit for 24 hours or less need no more attention than that required to supply a small quantity of feed and water at the beginning of the journey, but if the trip is long and the shipment large, greater supplies of feed and water will of course be needed, and it may be necessary to send along a caretaker. Plenty of fresh water should be accessible to the rabbits at all times. The same kinds of feed that they have been accustomed to eating in the rabbitry should be given them in transit.

Although shipping crates can be made from packing boxes, it is not only good business but effective advertising to ship the rabbits in durable crates that are neatly built, light in weight, and attractive (fig. 17). The shipper should furnish ample space in each compartment and see to it that wire netting effectively prevents the rabbits from gnawing the wood.

When rabbits are shipped by express, a bag of food and a printed request to feed and water the animals once daily should be attached to each crate. Advice should be given against exposing the animals to sun or rain and also against placing the crates near steam pipes. The purchaser should be notified when the rabbits were shipped.

KILLING AND SKINNING

When rabbits are slaughtered in large numbers the neck is usually dislocated by holding the animal by its hind legs and giving its head a pull and a quick upward snap. This not only is a humane way of killing but also prevents struggling, which is apt to discolor pelts with blood. The carcass is then suspended on a hook inserted between the tendon and the bone of a hind leg just above the hock, and either the jugular vein is cut or the head removed to permit free bleeding, so that the meat will have a good color. To give the carcass a better appearance, the tail is cut off, the free rear leg removed at the hock joint, and the front legs at the corresponding joint. The skin is then cut just below the hock of the suspended leg and opened to the root of the tail and along the inside of the other hind leg. The edges



FIGURE 17.—Crate for shipping live rabbits.

of the skin are separated carefully from the carcass, particular effort being made to leave all fat on the carcass as the skin is pulled down over the animal (fig. 18). This not only makes a more attractive meat product but facilitates drying the skin and prevents "fat burns" on the pelt in drying. When the skin is left entire it is known as case-skinned. Even small cuts lessen the value of the skins.

Particular care should be taken in dressing rabbits not to get hairs on the carcass. They are difficult to remove and if left give it an unattractive appearance. After the pelt has been removed the carcass

should be rinsed in cold water. This facilitates removal of hair and blood, and also cleanses the carcass. It is not a good practice to leave the carcass in water more than 15 minutes. Prolonged soaking causes it to absorb water, and the resulting presence of water in the meat is considered an adulteration of the product.

RABBIT MEAT

Domestic rabbit meat should not be offered for sale in the same style as wild rabbits. By offering a product that appears distinctive, producers may overcome any unfavorable impressions or prejudices that consumers have regarding rabbit meat. A neatly dressed rabbit, skinned, with the head and feet removed (fig. 19), is much more attractive in the meat market and impresses the prospective purchaser as likely to be more palatable than a rabbit partly dressed, with fur on. The heart, liver, and kidneys, especially the liver, are palatable and should not be considered as waste, for they add to the nutritional value of the product as a whole (pp. 1-2).

Wrapping the dressed carcass in cellophane will add to its general attractiveness. Rabbit meat cut into



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FIGURE 18.—Rabbit skins are taken off cased; that is, not split down the belly.

various pieces and packed neatly in a small pasteboard box with a cellophane front has a popular appeal. Special quickfreezing processes that have been developed for preserving various kinds of food have been successfully applied to rabbit meat, not only for long periods of storage but also for the immediate trade.

Directions for cooking rabbit meat can be found in Leaflet 66, Rabbit Recipes.

SKINS

Practically all rabbit skins imported from foreign countries and sold in the United States as well as those produced here eventually reach New York, the great marketing center of the raw-fur industry. There is

a demand for good pelts supplied in large quantities; but raw-fur buyers do not as a rule purchase pelts in small lots, as the expense of handling them is almost as much as for a large number. Some buyers will accept a few hundred pelts at one time, but the majority prefer to purchase in quantities of 25,000 to 100,000. This has made it difficult for most American breeders, who keep only a limited number of animals, to market their skins to advantage. They have consequently been obliged to sell in small quantities at almost any price offered, or to hold skins until the necessary large shipments can be accumulated, a practice that is usually inconvenient or impracticable because of lack of proper facilities.

The possibility of developing a large, steady market for pelts depends much on the rabbit breeders' ability to furnish the types of rabbit skins required by the fur trade and to organize central collecting agencies that can accumulate pelts and sell them in large quantities. Scattered over widely separated areas, and in most instances unfamiliar with the demands of the fur trade, rabbit breeders have made little effort to sort and grade their skins or to combine their shipments so as to offer larger quantities at one time and thus realize better returns. The profits in some cases have gone to buyers or middlemen who purchase skins from the breeders at low prices and sell them in larger quantities at much higher prices.

Enormous quantities of rabbit skins are used annually by the fur trade, largely because the processes of plucking, shearing, and dyeing have been so perfected that they can produce good imitations of the more expensive skins. Another reason for the enormous consumption is the fact that rabbit skins are available as a byproduct of another and more profitable industry—production of rabbit meat. Even in domestic-rabbit skins there is a great variation in density and quality, depending upon the degree that the various breeders give to these points in their selective matings.

Fur manufacturers can use only the prime, full-furred skins; poorer grades are used by hat-felt makers. Other things being equal, white, red, and blue skins, in the order named, are in greatest demand. White skins find the most ready market with the fur trade because they can be used in their natural color or can be dyed any desired

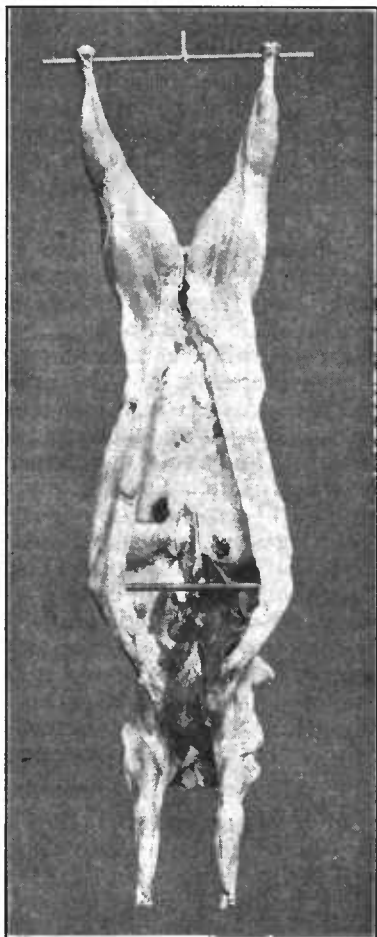


FIGURE 19.—A dressed carcass ready for the cooler.

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shade. For this reason white domestic rabbits have become more popular even where meat production is the primary aim.

Some rabbit skins are used in their natural colors, but this use is restricted because the rabbit breeder cannot so readily control his production as can the dyer. Even apparently well-matched raw skins become poorly matched after being dressed, and a large quantity of natural-colored skins must be available to permit proper blending of colors. Red and blue skins can be dyed many of the fashionable shades or used in their natural state undyed; but grays, browns, spotted silvers, and most others are mixed together and dyed black or some dark color. The bleaching process has been so perfected that rabbit skins of any color can now be bleached almost white at little cost and then dyed the more delicate shades. Large skins grown on the more mature rabbits during the colder months are the most suitable for the fur trade.

CURING

While still warm, skins to be cured should be placed flesh side out, the fore part over the narrow end of wire or board formers or shapers, care being taken to remove all wrinkles. Satisfactory skin shapers can be made from no. 9 galvanized wire 5 feet long. This equipment has been called a "stretcher", but the term may give an erroneous impression; it is not desirable to stretch the skins unduly, as this tends to weaken certain parts and also opens the fur. Skins should be so arranged on the shaper as to have the four legs on one side (fig. 20) and thus avoid any possible injury to the back fur, which is the most valuable. On the day after skinning, the pelts should be examined to see that the edges are drying flat and that the skin on the front legs is straightened out.

Rabbit skins should not be dried in the sun or by artificial heat, and they should be hung in such a way as to have the benefit of free circulation of air. All skins must be thoroughly dry before being packed. If they are not to be shipped for some time after being dried they should be hung in loose bundles of 50 in a cool dry place away from rats and mice. If they are kept any length of time in a warm climate or during the summer, they should be sprinkled with naphtha flakes. Salt should never be used in curing rabbit skins.

PACKING AND SHIPPING

To avoid spoilage or damage in transit, great care should be taken in packing skins for shipment. The fur should always be left inside, and so far as possible the skins should be kept in the same shape as when removed from the stretcher. Each one should be examined carefully to make sure that it is properly dried. A moist pelt or one that has patches of oily fat on it should not be packed or shipped.

Pelts that have been examined and are ready for shipment should be laid out flat, one overlapping the other, and made up into bales. Every 2 or 3 layers of skins, as they are being packed together, should be sprinkled with flaked naphthalene or paradichlorobenzene to keep out the insects that might damage the pelts in transit. When a bale has been finished it should be wrapped in paper and covered with burlap, sewed with strong cord or binder twine, and properly marked. Skins should always be well protected in this manner before being shipped.

SORTING AND GRADING

If the best prices are to be obtained, rabbit skins must be carefully sorted and graded for quality, color, and size. No mixed shipments

should be offered, for if good and poor skins of different sizes and colors are mixed, the entire shipment is usually accepted at the price of the poor skins.



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FIGURE 20.—The proper way to place a rabbit pelt on a shaper, or stretcher, all four legs on one side.

Raw-fur buyers usually grade rabbit skins as firsts, seconds, and thirds. Firsts and seconds are also divided into five classes, based on color: White, red, blue, chinchilla, and mixed. Some furriers also

grade firsts and seconds as large, medium, and small. The white, red, blue, and chinchilla skins should each be packed and shipped separately, whereas skins of all other colors may be put together.

Firsts are prime pelts of large size, well shaped, and properly stretched and dried, having all the hair and underfur intact, and the skin side free from fat, flesh, dark spots, streaks, and cuts. The thicker and denser the underfur on a pelt, the more valuable it is and the better price it will bring.

Seconds are pelts that have shorter hair and less underfur than firsts, and, except in white pelts, the skin usually shows dark spots or streaks, and sometimes large black splotches. The skin of a white pelt is white, even though the fur is poor. Seconds also include pelts that are improperly stretched and dried, that have rubbed in shipment, or that show the poor spots where the skin has been pierced or the hair is short or missing.

Thirds are pelts with short hair and thin underfur and those from animals taken too young or while shedding. Pelts that are badly cut or otherwise mutilated and poorly stretched and dried also are classed as thirds. Thirds are of no value to the furrier and are used exclusively in the manufacture of felt for hats.

TRADE NAMES

The following are some of the trade names applied to rabbit and hare pelts after they have been prepared for manufacturing purposes:

ARCTIC SEAL—seal-dyed rabbit.	ELECTRIC BEAVER—beaver-dyed rabbit.
AUSTRALIAN SEAL—sheared and seal-dyed Australian rabbit.	ELECTRIC MOLE—mole-dyed rabbit.
BALTIC BLACK FOX—black-dyed rabbit.	ELECTRIC SEAL—seal-dyed rabbit.
BALTIC BROWN FOX—brown-dyed hare.	ERMILINE—white rabbit.
BALTIC LEOPARD—Australian rabbit dyed and marked to resemble leopard.	ERMINETTE—white rabbit.
BALTIC LION—Australian rabbit in natural color.	FOX HAIR—fox-dyed hare.
BALTIC RED FOX—natural red Australian rabbit.	FRENCH BEAVER—beaver-dyed rabbit.
BALTIC SEAL—seal-dyed rabbit.	FRENCH CHINCHILLA—chinchilla-dyed hare.
BALTIC TIGER—Australian rabbit dyed and marked to imitate tiger.	FRENCH CONY—sheared white rabbit.
BALTIC WHITE FOX—natural white rabbit or natural white hare.	FRENCH LEOPARD—hare dyed and marked to resemble leopard.
BAY SEAL—seal-dyed rabbit.	FRENCH SABLE—sable-dyed rabbit.
BEAVERETTE—beaver-dyed rabbit.	FRENCH SEAL—sheared and seal-dyed rabbit.
BELGIAN BEAVER—beaver-dyed rabbit.	IMITATION ERMINE—white rabbit.
BLACK HARE—black-dyed hare.	LAPIN—sheared and dyed rabbit.
BLUERETTE—blue-dyed rabbit.	MENDOZA BEAVER—sheared and beaver-dyed rabbit.
CASTORETTE—beaver-dyed rabbit.	MESKIN BEAVER—sheared and beaver-dyed rabbit.
CHAPCHILLAS—sheared and chinchilla-dyed white hare.	MESKIN ERMINE—white rabbit.
CHINCHILLETTE—chinchilla-dyed rabbit.	MESKIN MOLINE—mole-dyed rabbit.
COAST SEAL—sheared and seal-dyed rabbit.	MESKIN SEAL—sheared and seal-dyed rabbit.
CONY—another name for rabbits, particularly those from Europe.	MINKONY—mink-dyed rabbit.
CONY LEOPARD—rabbit dyed and marked to imitate leopard.	MOLIN—mole-dyed rabbit, sheared.
CONY MOLE—sheared and mole-dyed rabbit.	MOLINE—mole-dyed rabbit.
	MUSKRATINE—sheared and seal-dyed rabbit.
	NEAR SEAL—sheared and seal-dyed rabbit.
	NORTHERN SEAL—sheared and seal-dyed rabbit.

NUTRIETTE—rabbit sheared and dyed to imitate nutria.	SABLE HAIR—sable-dyed hare.
POLAR SEAL—seal-dyed rabbit.	SEALETTE—seal-dyed rabbit.
RED RIVER SEAL—seal-dyed rabbit.	SEALINE—sheared and seal-dyed Australian rabbit.
ROMAN SEAL—seal-dyed rabbit.	SQUIRRELETTE—squirrel-dyed rabbit.
RUSSIAN LEOPARD—rabbit dyed and marked to imitate leopard.	SQUIRRELINE—squirrel-dyed rabbit.
	VISONETTE—mink-dyed rabbit.

TANNING SKINS FOR HOME USE

Rabbit skins to be sold should not be tanned before shipment; fur buyers prefer to purchase them in the raw state. If intended for home use, however, they may be tanned by the methods herein described, but it should not be expected that they will compare favorably in appearance and pliability with the product of a tannery or factory operated by experienced workmen and equipped with modern machinery.

In tanning, the first step is to get the skin thoroughly softened, clean, and free from flesh and grease. If cased, or whole, the skin should be split down the middle of the belly and then soaked in several changes of clean, cool water. When it becomes soft, it should be laid over a pole or board and work begun over the skin side with a coarse file or dull knife, breaking up and removing the adhering tissue, flesh, and fat, and at the same time working the grease and oil out of the skin. It is useless to start tanning until all the tissue, fat, and grease have been removed and the skin has been made uniformly soft and pliable.

The thickness and condition of the pelt determine the length of time a skin must be soaked, some skins requiring 2 or 3 hours and others longer. A skin should be soaked until it is soft, but it should not remain wet longer than necessary, as the hair may start to slip. When the skin has been thus treated and is somewhat softened, it should be worked in lukewarm water containing 1 ounce of soda or borax to the gallon. Soap added to the water is also helpful in cutting the grease and softening and cleansing the skin. After the skin has been rinsed thoroughly in lukewarm water, the water should be squeezed out, but the pelt should not be wrung. Finally, the skin should be worked in gasoline, which should remove the last particles of dirt and grease. It is then ready for tanning.

There are several methods of tanning rabbit skins. For a comprehensive treatment of tanning, the reader should consult Farmers' Bulletin 1334, Home Tanning of Leather and Small Fur Skins. Directions for using two of the more successful methods, known as the salt-acid and the salt-alum processes, are here given.

SALT-ACID PROCESS

The salt-acid formula calls for a solution made up of 1 pound of common salt and one-half ounce of concentrated sulphuric acid to each gallon of water. Dissolve the salt in the water and carefully pour in the acid while stirring. This tanning liquor should be made and used in glass or earthen jars or wooden vessels; never in metal containers of any kind. When pouring in the acid, do not inhale the fumes given off. Be careful also not to get any of the strong acid on the skin or clothing. As soon as the salt-acid solution has cooled, it is ready for use.

Put the cleaned, softened skin in the solution so that it is entirely covered. After 1 to 3 days, during which it has been stirred frequently, remove it and rinse in clean, cool water. The skin should then be worked for about 10 minutes in a solution of 1 ounce of borax to 1 gallon of water. Rinse again in clean water and squeeze (but do not wring) as dry as possible. Work the skin a few minutes in the hands by rubbing and pulling, then tack it out flat, flesh side up, and apply a thin coating of grease or oil and let it dry. Fresh butter, neatsfoot oil, or olive oil are good for this purpose.

When the pelt is nearly dry but still damp, begin to work it with the hands, stretching it in all directions and working the flesh side over the edge of a board and pulling it back and forth as if shining shoes with a cloth. If the skin is rough it may be smoothed by working it over a sandpaper block, which also helps to make it soft and pliable. Much of the success in producing a soft, pliable skin depends upon this repeated working, which must be done while the skin is drying out and not after it is dry.

If the skin is not soft enough when dry it should be dampened and worked again as before. If still greasy it may be given a hasty bath in gasoline. A final cleaning, accomplished by working the skin in warm, dry, hardwood sawdust, is beneficial and will add to the luster of the fur.

SALT-ALUM PROCESS

The salt-alum formula calls for 1 pound of ammonia alum (ammonium aluminium sulphate) or potash alum (potassium aluminium sulphate) dissolved in 1 gallon of water; and 4 ounces of washing soda (crystallized sodium carbonate) and 8 ounces of common salt dissolved together in one-half gallon of water. Pour the soda-salt solution slowly into the alum solution while stirring vigorously. Mix the combined solution, as used, with sufficient flour to make a thin paste, first mixing the flour with a little water to prevent lumps.

The skin, cleaned and softened as previously described, should be tacked out smoothly, flesh side up, on a board and then coated about an eighth of an inch thick with the tanning paste and protected with paper or sacking laid so that it does not come in close contact with the paste. The next day scrape off most of the paste and give another coating. At intervals of a day repeat this application 2 or 3 times, depending upon the thickness of the skin. Only thick skins from mature bucks will need as many as three applications. Leave the last coating on for 3 or 4 days. Finally scrape off the paste and work the skin in borax water, and rinse, squeeze, and then stretch and work it over a board in the manner described in connection with the salt-acid process.

The salt-alum process is widely used and is considered slightly better than the salt-acid tannage, although alum-tanned skins often come out stiff and hard and require much working to make them soft and pliable.